# A Methodology for Quickly Increasing the Geographic Granularity in Distributed Resource Plans

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# Caveat

This presentation has been influenced by Kevala's participation in the More Than Smart working group but expressly is not a formal representation of any MTS work products or positions of any MTS working group participants.

# Presentation overview

Need for greater data granularity

Timing issues in R.14-08-013 and beyond

California's existing valuation methodologies

Low hanging fruit –

- Kevala's data perspective
- Opportunities for increased granularity

Individual elements of the methodology

# The spectacular inefficiency…

## …of life before granular data

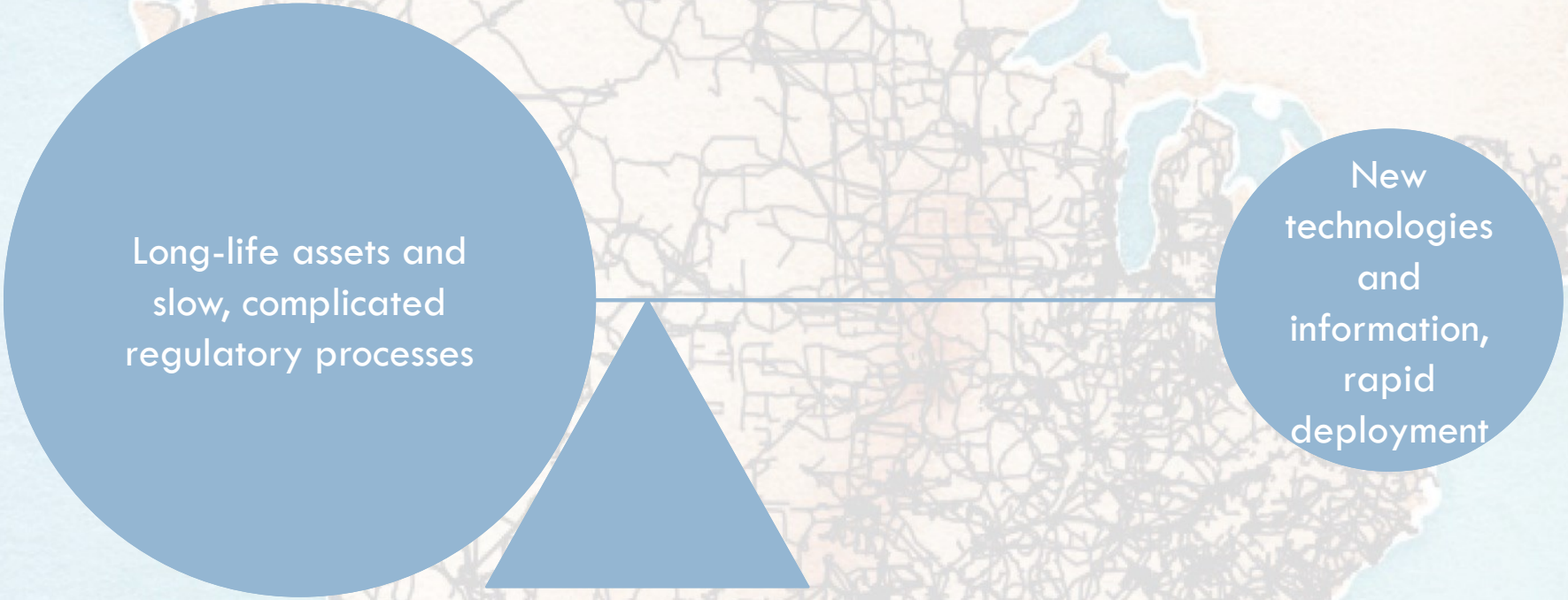
# Change is happening.
# The grid edge is the field of play

Massive volatility in technology innovation

Rate arbitrage, customer choice

Erosion of margins in the bulk power system

# An industry in transition



# On change…

What is possible?

- Dreams vs. Nightmares

Lessons from past mistakes

- California Energy Crisis

# …and timing

Statutory deadlines

Proceeding deadlines

Filing deadlines

Pre-filing deadlines

Market deadlines, other proceedings, other processes, other organizations, inter-organization deadlines…

# The wisdom of pacing

Walking, Jogging, Running

# Q: Are California's resource valuation methodologies up for the task?

The CPUC predominantly relies on variants of an 2004 vintage avoided cost methodology developed by the Rocky Mountain Institute (RMI) and Energy and Environmental Economics (E3).

Has been modified over time to reflect different DERs and different kinds of resource valuation.

Relies on system-level input assumptions that distort local price signals.

# A: Not in their current form, but increasing their geographic granularity…

**…does not create a new kind of valuation flaw.**

Errors caused by forecasting assumptions are similar to zonal errors, but localized in their impact.

**…addresses problems with geographic biases against locational variation in avoided costs.**

Avoids the dampening effects of averages.

**…can be done in weeks not years.**

Additional elements can be developed over months and used to fine tune the DRP evaluation process with minimal disruption.

# DER Value Categories (1/2)

| Value Category | Definition |
|---|---|
| **WECC Regional System** | WECC Regional bulk power system benefits not reflected in System Energy Price or LMP |
| **Thermal Generation (System Energy Price)** | Estimate of marginal wholesale system wide value of energy (valued at $0/MWh when renewables are on the margin) |
| **Local Transmission Losses & Congestion** | Avoided locational transmission losses and congestion |
| **Ancillary Services** | Reduced system operations and reserves (or costs) required for electricity grid reliability |
| **RPS Generation & Integration Costs** | Cost reductions from being able to procure RPS energy at lower prices, procure a lesser amount of energy and capacity, and reduced costs of integration |
| **System Capacity** | The reduced reliability-related cost of maintaining a generator fleet with enough capacity to meet annual peak loads and the planning reserve margin |
| **Transmission Access Charges** | LSE avoided Transmission Access Charges (subject to FERC tariff change that rebalances costs) |
| **Transmission Capacity** | Reduced need for system & local area transmission capacity |
| **Distribution Losses** | Estimate of value of additional marginal wholesale value of energy due to losses between the point of the wholesale transaction and the point of delivery |
| **Subtransmission Capacity** | Reduced need for local subtransmission capacity expansion to meet customer peak loads |
| **Distribution** Substation & Feeder Capacity (Local) | Reduced need for local distribution capacity expansion to meet customer peak loads |
| **Power Quality** | Improved steady state voltage control within standards and reduced transient or momentary under/over voltage and harmonics |
| **Reliability** | Reduced frequency and duration of distribution feeder outages typically measured in SAIDI/SAIFI |
| **Resiliency** | Improved ability to withstand and recover from external threats, i.e., cyber, catastrophic, cascading) |
| **Safety** | Improved safety as a result of new technology integration |

| |
|---|
| **Blue = NEM 2.0 Identified Values** |
| **Yellow = MTS identified value** |

# DER Value Categories (2/2)

| Value Category | Definition |
|---|---|
| **Customer Choice** | Customer's ability to choose alternative reliability enhancement and supply options. Societal value associated with robust market for customer alternatives |
| **CO2 Emissions** | The cap-and-trade allowance revenue or cost savings due to reductions in carbon dioxide emissions (CO2) |
| **Criteria Polutants** | Avoided permit costs, Cap Ex (emission controls), OpEx (GHG market, emission control operation) |
| **Health Benefits** | Public health costs; business health costs, avoided lost work days |
| **Water Use** | Reduced water consumption by power generation cooling |
| **Land Use** | Permit market costs; real estate value |
| **Improved Energy & Water Security** | Reduced risks derived from gretare supply diversity, transportation electrification and syneries with water management |
| **Jobs** | Direct, Indirect, and Induced employment (increased economic activity, decreased unemployment related costs) |
| **Economic Impact** | State or local net economic impact (investment, income, GDP, public revenue [tax & fee income]) |

| |
|---|
| **Blue = NEM 2.0 Identified Values** |
| **Yellow = MTS identified value** |

Chart by SolarCity

# Minimally modifying the methodology to better reflect local valuations

Low hanging fruit that can be quickly implemented

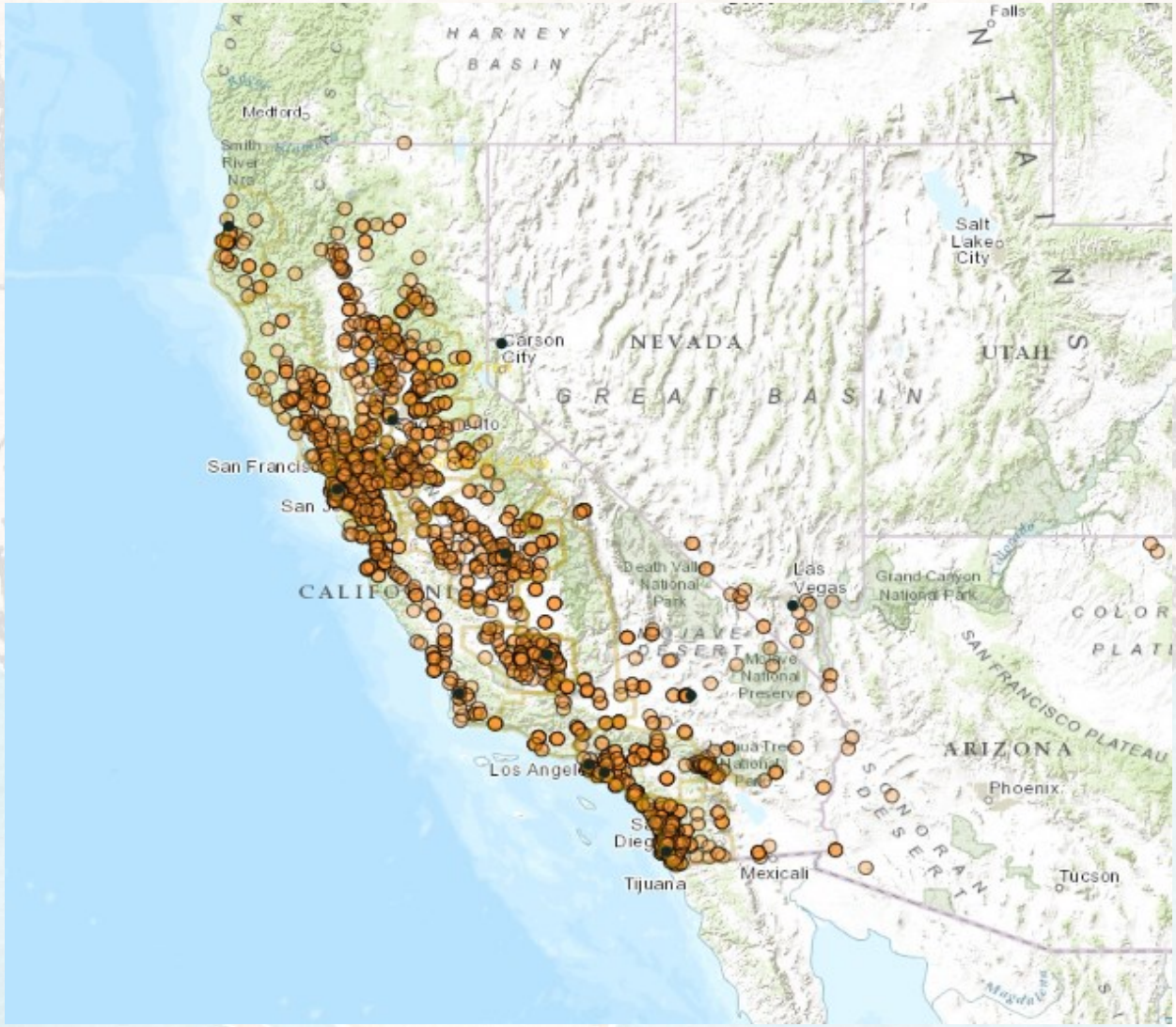
| Component | Avoided Cost | Benefit | Granularity for 2015 DRP | Data Sources |
|---|---|---|---|---|
| **Energy + Losses + Congestion** | X | | PNode | LMP Pricing Data by PNode |
| **Generation Capacity** | X | | Local Capacity Areas | CAISO Local Technical Study; CPUC RA Reports; CPUC Historical RA Contracts; IOU RA-Only Contract Data |
| **Distribution Capacity** | X | | Substation | Utility capacity investment plans (10 year horizon) |

# Why do we think this is possible?

Live SPOOL demo (representative images on subsequent pages)

# Local Reliability Areas with known capacity prices

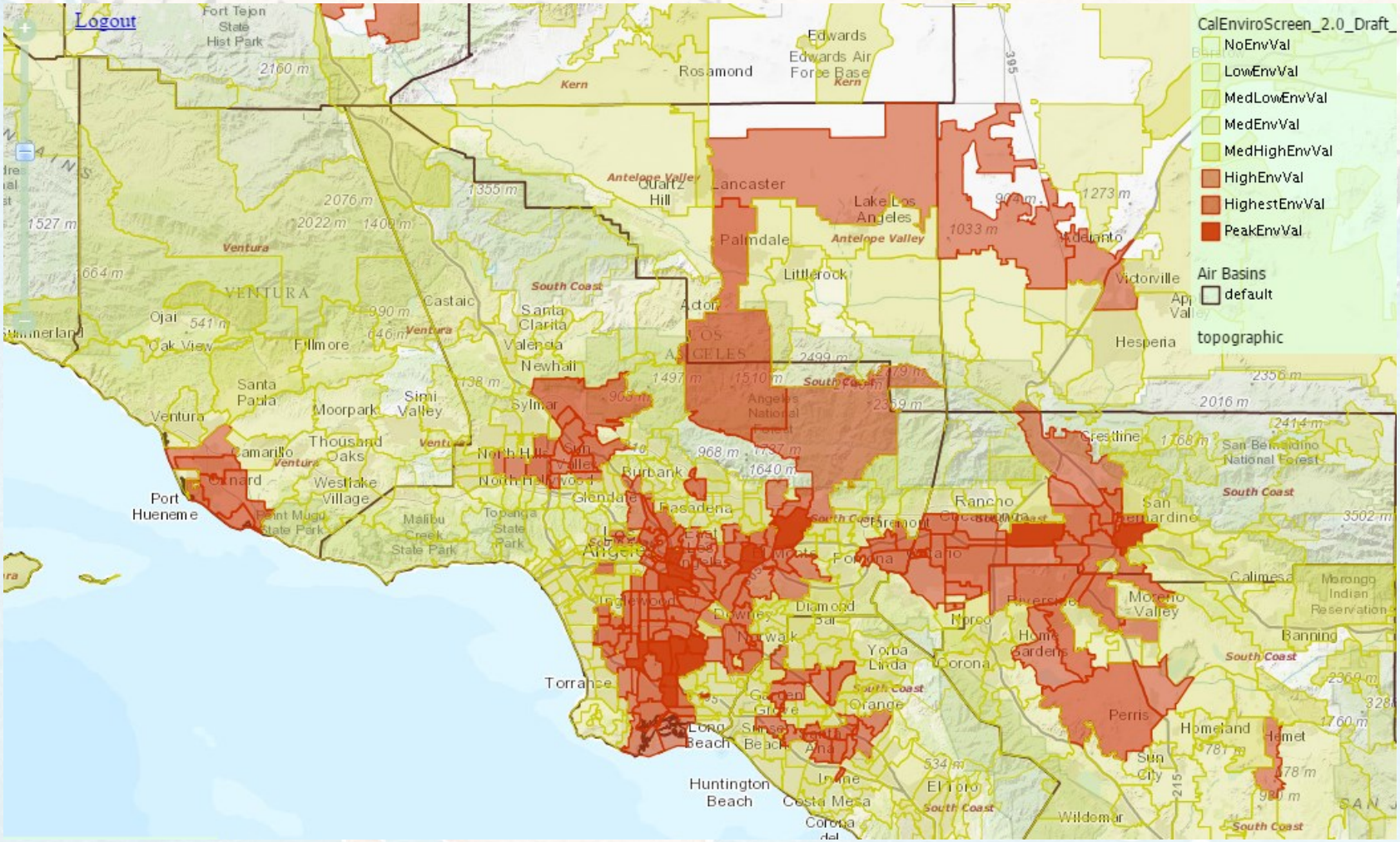
# Locational Marginal Price nodes and locations



# Air quality and health impacts

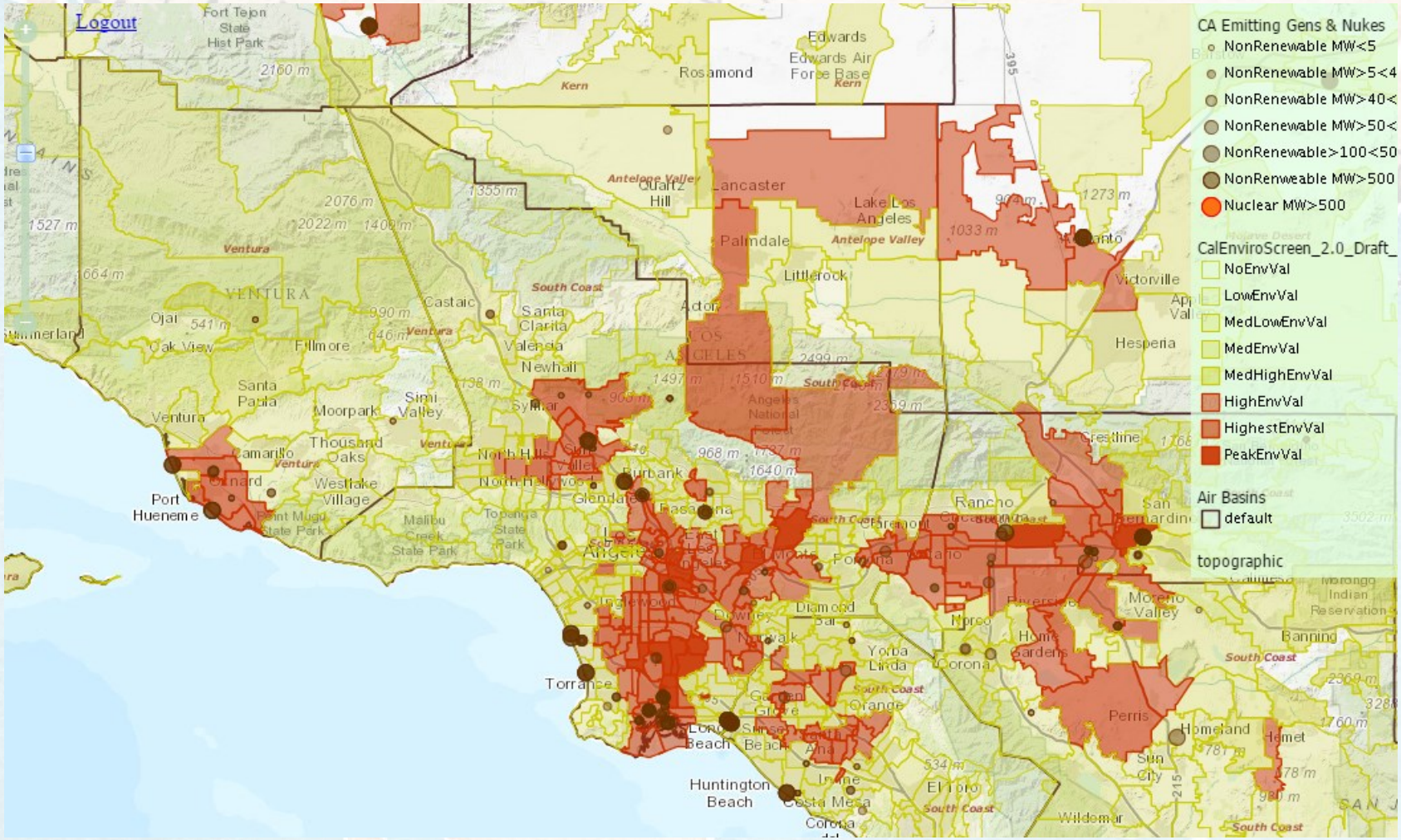
# Air basins

# Air quality and health impacts
# Cal Enviro Screen/PM 10 & 2.5 data



# Air quality and health impacts

## Point source emissions



# Compatible with RAM map analysis

Enables visual assessment of hosting capacity and cost efficacy

Can be used to target upgrades where DER demand exceeds current thresholds

# Proposed methodology modifications

**Energy:** Restore localized energy values via 4 tranche deviation and volatility modifier (250 hours super peak, 250 hour trough, 6X16 peak, off peak) based on historical LMPs.

**Capacity:** Replace system capacity value and balance year with local reliability area capacity value and net short year.

**T&D:** Add substation specific new capacity avoidance value

**Air Quality:** Air basin specific public health adder based on Cal Enviro Screen 2.0

# Thank you

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# Background/Notes slides

# The value of the resource stack

## RMI/E3 DERACT levelized avoided cost top 250 hours

| | Energy | Losses | AS | Emissions | Capacity | T&D | RPS | Total |
|---|---|---|---|---|---|---|---|---|
| | 9% | 1% | 0% | 2% | 64% | 23% | 1% | 100% |
| Average | $87.97 | $8.61 | $0.88 | $22.12 | $650.95 | $236.08 | $13.61 | $1,020.21 |
| Min | $49 | $4 | $0 | $14 | $0 | $0 | $14 | $603 |
| Max | $197 | $21 | $2 | $24 | $2,040 | $5,790 | $14 | $5,902 |
| | | | | | | | | |
| $/kW-yr | $22.08 | $2.16 | $0.22 | $5.55 | $163.39 | $59.26 | $3.42 | $256.07 |

# The value of the resource stack

## RMI/E3 DERACT levelized avoided cost top 8760 hours

| | Energy | Losses | AS | Emissions | Capacity | T&D | RPS | Total |
|---|---|---|---|---|---|---|---|---|
| | 46% | 3% | 0% | 13% | 17% | 8% | 11% | 100% |
| Average | $54.56 | $3.99 | $0.55 | $15.72 | $20.20 | $9.91 | $13.61 | $118.53 |
| Min | -$16 | -$1 | $0 | $12 | $0 | $0 | $14 | $9 |
| Max | $197 | $21 | $2 | $24 | $2,040 | $5,790 | $14 | $5,902 |
| | | | | | | | | |
| $/kW-yr | $477.91 | $34.96 | $4.78 | $137.69 | $176.99 | $86.85 | $119.19 | $1,038.37 |

# All valuation methodologies are flawed

The RMI/E3 DERACT (and all other valuation methodologies) rely on assumptions about key inputs to which they are sensitive.

- Energy costs
- Carbon costs
- Long-run capacity costs
- Population and economic projections
- (Rate structures)